

BAB V

KESIMPULAN DAN SARAN

A. Kesimpulan

Berdasarkan hasil penelitian dapat disimpulkan bahwa :

1. Mutu fisik dan profil disolusi dari sediaan tablet nifedipin generik dan nifedipin merek dagang hampir sama, keduanya memenuhi persyaratan standard kontrol kualitas tablet yang baik.
2. Sediaan tablet nifedipin generik dan nifedipin merek dagang menghasilkan profil disolusi yang tidak jauh berbeda, ditunjukkan dengan nilai f_2 antara 50 - 100.

B. Saran

Saran dari hasil penelitian ini adalah :

1. Perlu dilakukan penelitian lebih lanjut dalam hal perbandingan pelepasan obat antara produk generik dan produk merek dagang dengan berbagai pH yang berbeda.
2. Perlu pengembangan metode analisis untuk menganalisa terjadinya kerusakan pada nifedipin.
3. Produk nifedipin generik memenuhi persyaratan standard yang ditetapkan sehingga memiliki kualitas tidak jauh berbeda dengan produk nifedipin merek dagang, tidak ada salahnya jika masyarakat selaku konsumen mulai beralih

menggunakan produk nifedipin generik yang harganya lebih terjangkau dibandingkan dengan harga produk nifedipin merek dagang.

DAFTAR PUSTAKA

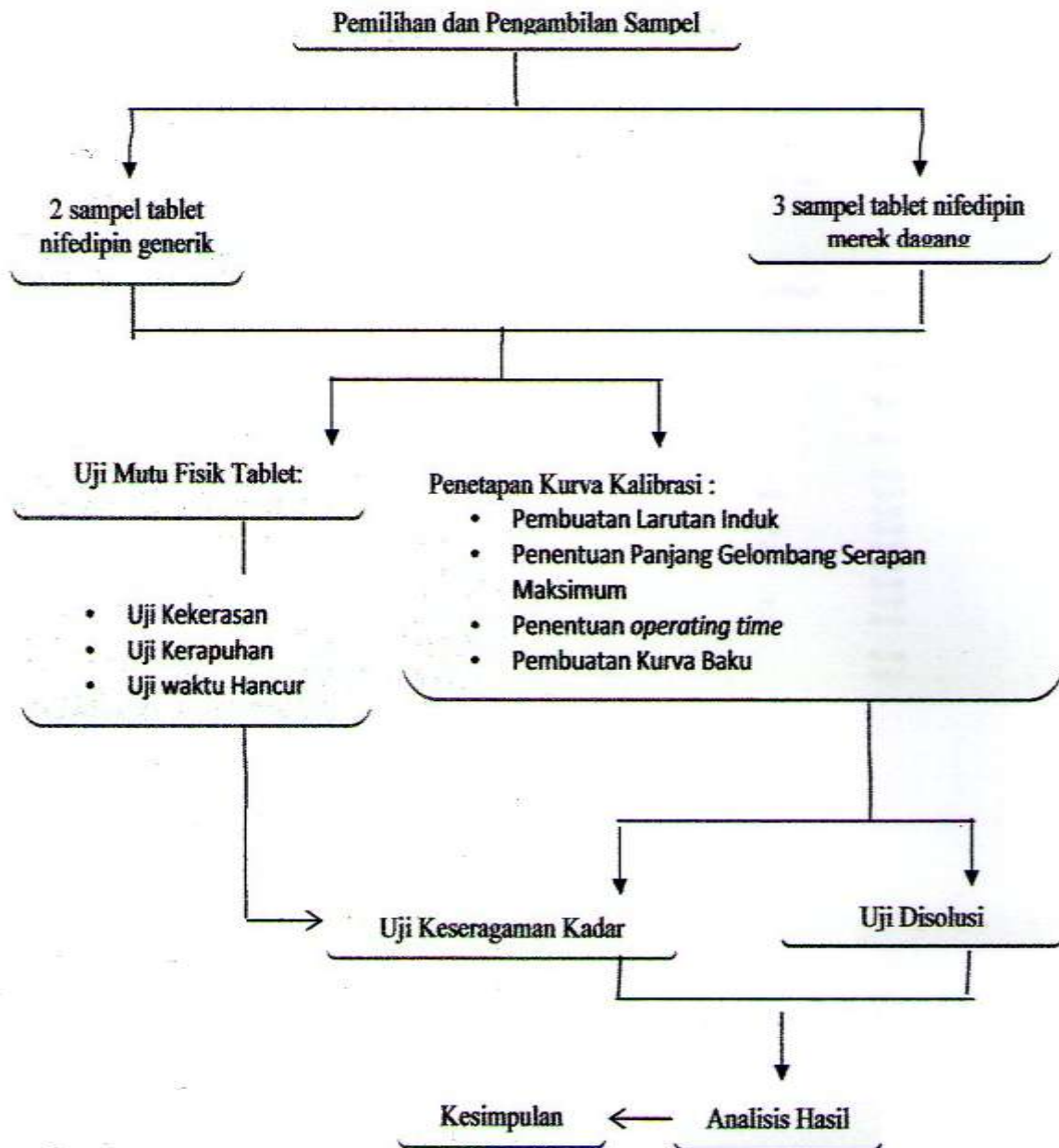
- Anief, M. 1997. *Ilmu Meracik Obat, Teori dan Praktik*. Gadjah Mada University Press. Yogyakarta.
- Anief M. 1993. *Farmasetika*. Yogyakarta : Gadjah Mada University Press. hlm. 36.
- Anief M. 2004. *Prinsip Umum dan Dasar Farmakologi*. Yogyakarta : Gadjah Mada University Press. hlm.121.
- [Anonim]. 1979. *Farmakope Indonesia Edisi III*. Jakarta: Departemen Kesehatan Republik Indonesia. hlm. 6-7, 745, 753.
- [Anonim]. 1990. *Panduan Pelayanan Informasi Obat*. Edisi Obat Generik. Jakarta: PT. Kimia Farma. hlm. 1-2.
- [Anonim]. 1995. *Farmakope Indonesia Edisi IV*. Jakarta: Departemen Kesehatan Republik Indonesia. hlm. 486, 1026, 1086, 1087.
- [Anonim]. 1997. *Guidance for Industry: dissolution testing of immediate release solid oral dosage forms*. Rockville: U.S. Department of Health and Human Services Food and Drug Administration Center for Drug Evaluation and Research. hlm. 9.
- [Anonim]. 2008. *Informasi Obat Nasional Indonesia*. Jakarta: Badan Pengawas Obat dan Makanan Republik Indonesia. hlm. 1, 4.
- [Anonim]. 2009. *Kumpulan Kuliah Farmakologi*: Fakultas Kedokteran Universitas Brawijaya. hlm. 7-11.
- Banker GS, Anderson NR. 1994. *Tablet*, in Lachman L, Lieberman HA, Kanig JL (Eds), *The Theory and Practise of Industrial Pharmacy*. Edisi ke-3. Lea and Febriger. USA: Philadelphia. hlm. 643-731.
- Chander Shekar B, Shireesh Kiran R, Nagendra Babu B., 2010. Preparation and Evaluation of Gastro Retentive Floating Tablets of Ketokonazole. *International Jurnal Of Pharma Research and Development*. 2(9).
- Costa Paulo, Lobo JMS. 2001. Review : modeling and comparison of dissolution profiles. *European Journal of Pharmaceutical Sciences* 13:123-133.
- [Depkes RI] Departemen Kesehatan Republik Indonesia. 1995. *Farmakope Indonesia*. Jilid IV. Jakarta: Departemen Kesehatan Republik Indonesia.

- Ditjen POM. (1995). *Farmakope Indonesia*. Edisi IV. Jakarta: Departemen Kesehatan Republik Indonesia. Jakarta. hlm. 611-613.
- Fudholi A. 2013. *Disolusi dan Pelepasan Obat in vitro*. Ed ke-1. Yogyakarta: Pustaka Pelajar. hlm. 111, 143-144.
- Harianto, Sabarijah W., dan Transitawuri F., 2006. Perbandingan Mutu dan Harga Tablet Amoksisilin 500mg Generik dengan Non Generik yang Berbeda di Pasaran. *Majalah Ilmu Kefarmasian* 3: 127-142.
- Hosiana V, Mukhtar MH, Wahid N. Uji daya antimikroba secara invivo dan studi farmakokinetik amoksisilin generik dan merek dagang. *Jurnal Sains dan Teknologi Farmasi*. 2000, 5, 5.
- Howard C Ansel. 2008. *Pengantar Bentuk Sediaan Farmasi* Ed. 4. Jakarta. UI-Press.
- Idris F. 2010. Obat Generik, Harga Murah Tapi Mutu Tidak Kalah. <http://batamfit.blogspot.com/2010/07/obat-generik-harga-murah-tapi-mutu.html> [Juli 2010].
- Lachman *et al.* 1994. *Teori dan Praktek Farmasi Industri*. Jilid II. Siti Suyatmi, penerjemah; Jakarta: Universitas Indonesia Press. Terjemahan dari: *The theory and practice of industrial pharmacy*.
- Martin A, S Warbrick J, Cammarata A. 2006. *Farmasi Fisik: dasar-dasar kimia fisik dalam ilmu farmasetika*, Edisi III Yoshita, penerjemah; Jakarta: Universitas Indonesia press. Terjemahan dari: *Physical Pharmacy*. hlm. 846-847.
- Mycek MJ *et al.* 2001. *Farmakologi Ulasan Bergambar*. Edisi II. Agoes A, penerjemah; Hartanto H, editor. Jakarta: Widya Medika. hlm. 344.
- Parrott EL. 1971. *Pharmaceutical Technology Fundanmental Pharmaceutics*. 3th Ed. Minneapolis: Burgess Publishing Company. Hal 73-86.
- Patel Nirav *et al.* 2008. Comparison of In Vitro Dissolution Profiles of Oxcarbazepine-HP b-CD Tablet Formulations with Marketed Oxcarbazepine Tablets. *Dissolution Technology* 15:28-34.
- Raini M, Mutiatikum D, Larasati P. 2010. Uji Disolusi dan Penetapan Kadar Tablet Loratadin Invator dan Generik Bermerek. *Media Litbang Kesehatan* 20.
- Rutoto, Sabar. 2007. *Pengantar Metodologi Penelitian*. FKIP: Universitas Muria Kudus.

- Sadray Sima et al. 2010. Dissolution Profile Comparison: model dependent and model independent approaches. *International Journal of Pharma and Bio Sciences* 1 (2).
- Shargel L, Yu A. 2005. *Biofarmasetika dan Farmakokinetika Terapan*. Edisi II. Fasich, Sjamsiah S, penerjemah; Surabaya: Airlangga University Press. Hlm. 86,96,167, 170, 184.
- Singh SK, Prakash D, Srinivasan KK. 2011. Dissolution Testing of Formulation: a regulatory, industry and academic perspective. *Asian Jurnal of Biochemical and Pharmaceutical Research* 1 (1).
- Siregar CPJ, Wikarsa S. 2010. *Teknologi Farmasi Sediaan Tablet, Dasar-dasar Praktis*. Jakarta:EGC. hlm. 54, 56, 83-84, 85-89, 96, 99-115.
- Siswandono dan Soekardjo, B. (1995). *Kimia Medisinal*. Surabaya: Airlangga University Press. hlm 364, 367.
- Stoklosa M. J., Ansel H. C. *Pharmaceutical calculations*, 9th Ed. London: Lea&Febiger, 1991: 74-89.
- Sugiyono. 2011. *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: AFABETA, cv.
- Sunoko, Henna Rya. *Calculations Associated with Drug Availability and Pharmacokineticsin Strategy to Improve Drug Rationality*. Medical Faculty Diponegoro University. Semarang. 2004.
- Tjay HT, Rahardja K. 2007. *Obat-obat Penting*. Edisi VI. Jakarta: PT. Elex Media Komputindo. hlm. 13-14, 16.
- Voigt, R. 1994. *Buku Pelajaran Teknologi Farmasi*. Edisi V. Soendani Noerono Soewandhi, penerjemah; Moch. Samhoedi Reksohadiprodjo, editor; Yogyakarta: Universitas Gadjah Mada Press. Terjemahan dari: *Lehrbuch Der Pharmazeutischen Technologie*.
- Yumni, M. Z. 2012. Obat Generik Berlogo. Solusi Sehat Yang Cerdas. <http://www.kabarindonesia.com/> diakses tanggal 4 Juli 2012

L
A
M
P
I
R
A
N

Lampiran 1. Skema jalannya penelitian



Lampiran 2. Sertifikat analisis nifedipin

Certificate of Analysis

Item Number : C-20079200
 Description : NIFEDIPINE MICRONIZED
 Batch No. : 400196067
 Manufacturing Date : 27-AUG-13
 Expired Date : 26-AUG-18

NUMBER	CHARACTERISTIC	SPECIFICATION	ACTUAL RESULTS	MEASURE	PASS
10	Appearance	Yellow powder and it is affected by Exposure to light (as information)	Conform		Accept
20	Solubility	Practically insoluble in water. freely soluble in acetone	Conform		Accept
30	Infrared absorption Spectrophotometry	Positive	Positive		Accept
31	UV absorption Spectrophotometry	Positive	Positive		Accept
40	Loss on drying	$\leq 0.5\%$	0.0	%	Accept
50	Heavy metals	≤ 10 ppm (Method II)	< 10	ppm	Accept
60	Sulphated ash	$\leq 0.1\%$	0.0	%	Accept
70	Melting range	171 deg C - 175 deg C	174	deg C	Accept
80	Limit of chloride	$\leq 0.02\%$	< 0.02	%	Accept
90	Limit of sulfate	$\leq 0.05\%$	< 0.05	%	Accept
100	Related Substances	Conform	Conform		Accept
110	Perchloric acid titration	≤ 0.12 ml.	0.08	ml.	Accept
120	Assay	98.0% - 102.0% (Calculated on the dried basis)	101.0	%	Accept
130	Particle Size < 10 micron	(75% - 95%)	Conform		Accept
140	particle Size < 30 Micron	(98%)	Conform		Accept

13 August 2014


 PT. HINDIA FARMA
 Effendi, S.Si, Apt
 Quality Manager

Lampiran 3. Hasil pemeriksaan kekerasan tablet

No	Kekerasan Tablet (Kg)				
	OGA	OGB	ODC	ODD	ODE
1	14,3	10,81	16,5	7,2	12,1
2	14,1	11,3	16,4	7	12,3
3	14,2	11,2	16,3	7,1	12,2
4	14,2	10,8	16,4	7,2	12,1
5	14,4	11,2	16,1	7,2	12,4
6	14,1	11,1	16,3	7	12,5
7	14,3	11,1	16,2	7,3	12,1
8	14,2	10,9	16,1	7,4	12,3
9	14,3	10,8	16,3	7,1	12,4
10	14,1	11,3	16,3	7,2	12,5
\bar{x}	14,22	11,051	16,29	7,17	12,29
SD	0,10328	0,205505	0,128668	0,125167	0,159513

Npar Tests

One-Sample Kolmogorov-Smirnov Test

		OGA	OGB	ODC	ODD	ODE
N		10	10	10	10	10
Normal Parameters ^{a,b}	Mean	14.2200	11.0510	16.2900	7.1700	12.2900
	Std. Deviation	.10328	.20550	.12867	.12517	.15951
Most Extreme Differences	Absolute	.181	.194	.231	.205	.183
	Positive	.177	.180	.169	.205	.183
	Negative	-.181	-.194	-.231	-.195	-.155
Kolmogorov-Smirnov Z		.571	.614	.730	.649	.579
Asymp. Sig. (2-tailed)		.900	.845	.660	.793	.890

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Kekerasan Tablet

Levene Statistic	df1	df2	Sig.
2.746	4	45	.040

Kruskal-wallis tests**Test Statistics^{a,b}**

	Kekerasan Tablet
Chi-Square	47.165
Df	4
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: formula

Mann-Whitney Test**OGA-OGB****Test Statistics^b**

	kekerasan
Mann-Whitney U	.000
Wilcoxon W	55.000
Z	-3.803
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGA-ODC**Test Statistics^b**

	kekerasan
Mann-Whitney U	.000
Wilcoxon W	55.000
Z	-3.814
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGA-ODD**Test Statistics^b**

	Kekerasan Tablet
Mann-Whitney U	.000
Wilcoxon W	55.000
Z	-3.814
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGA-ODE

Test Statistics^b

	Kekerasan Tablet
Mann-Whitney U	.000
Wilcoxon W	55.000
Z	-3.807
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGB-ODC

Test Statistics^b

	Kekerasan Tablet
Mann-Whitney U	.000
Wilcoxon W	55.000
Z	-3.803
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGB-ODD

Test Statistics^b

	Kekerasan Tablet
Mann-Whitney U	.000
Wilcoxon W	55.000
Z	-3.803
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGB-ODE

Test Statistics^b

	Kekerasan Tablet
Mann-Whitney U	.000
Wilcoxon W	55.000
Z	-3.795
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

ODC-ODD

Test Statistics^b

	Kekerasan Tablet
Mann-Whitney U	.000
Wilcoxon W	55.000
Z	-3.814
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

ODC-ODE

Test Statistics^b

	Kekerasan Tablet
Mann-Whitney U	.000
Wilcoxon W	55.000
Z	-3.807
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

ODD-ODE

Test Statistics^b

	Kekerasan Tablet
Mann-Whitney U	.000
Wilcoxon W	55.000
Z	-3.807
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

Lampiran 4. Hasil pemeriksaan kerapuhan tablet

1. Produk obat generik A (OGA)

Bobot Tablet	Replikasi		
	1	2	3
Sebelum (gram)	4,618	4,622	4,596
Sesudah(gram)	4,612	4,618	4,588
Kerapuhan (%)	0,129926	0,086543	0,174064
$\bar{x} \pm SD$	0,13 \pm 0,04		

2. Produk obat generik B (OGB)

Bobot Tablet	Replikasi		
	1	2	3
Sebelum (gram)	6,51	6,62	6,562
Sesudah(gram)	6,502	6,61	6,55
Kerapuhan (%)	0,122888	0,151057	0,182871
$\bar{x} \pm SD$	0,15 \pm 0,03		

3. Produk obat bermerk dagang C (ODC)

Bobot Tablet	Replikasi		
	1	2	3
Sebelum (gram)	6,144	6,224	6,17
Sesudah(gram)	6,138	6,218	6,162
Kerapuhan (%)	0,097656	0,096401	0,12966
$\bar{x} \pm SD$	0,11 \pm 0,02		

4. Produk obat bermerk dagang D (ODD)			
Bobot Tablet	Replikasi		
	1	2	3
Sebelum (gram)	4,97	5,008	4,96
Sesudah(gram)	4,946	4,984	4,938
Kerapuhan (%)	0,482897	0,479233	0,443548
$\bar{x} \pm SD$	0,47 \pm 0,02		

5. Produk obat bermerk dagang E (ODE)			
Bobot Tablet	Replikasi		
	1	2	3
Sebelum (gram)	5,264	5,262	5,264
Sesudah(gram)	5,258	5,252	5,256
Kerapuhan (%)	0,113982	0,190042	0,151976
$\bar{x} \pm SD$	0,15 \pm 0,04		

Cara perhitungan kerapuhan tablet :

Produk generik A (OGA)

$$\% \text{ Kerapuhan} = \frac{(\text{bobot sebelum uji} - \text{bobot sesudah uji})}{\text{bobot sebelum uji}} \times 100\%$$

$$= \frac{(4,618 \text{ gram} - 4,612 \text{ gram})}{4,618 \text{ gram}} \times 100\%$$

$$= 0,129926\%$$

NPar Tests

One-Sample Kolmogorov-Smirnov Test

		OGA	OGB	ODC	ODD	ODE
N		3	3	3	3	3
Normal Parameters ^{a,b}	Mean	.1302	.1522	.1077	.4686	.1520
	Std. Deviation	.04376	.03002	.01903	.02174	.03801
Most Extreme Differences	Absolute	.175	.183	.379	.355	.175
	Positive	.174	.183	.379	.255	.175
	Negative	-.175	-.179	-.277	-.355	-.175
Kolmogorov-Smirnov Z		.304	.316	.657	.615	.303
Asymp. Sig. (2-tailed)		1.000	1.000	.781	.844	1.000

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Kerapuhan

Levene Statistic	df1	df2	Sig.
.374	4	10	.822

ANOVA

Kerapuhan

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.270	4	.068	66.344	.000
Within Groups	.010	10	.001		
Total	.280	14			

Post Hoc Tests

Multiple Comparisons

Kerapuhan

LSD

(I) formula si	(J) formula si	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
OGA	OGB	-.02210	.02605	.416	-.0801	.0359
	ODC	.02227	.02605	.413	-.0358	.0803
	ODD	-.33838*	.02605	.000	-.3964	-.2803
	ODE	-.02183	.02605	.422	-.0799	.0362
OGB	OGA	.02210	.02605	.416	-.0359	.0801
	ODC	.04437	.02605	.119	-.0137	.1024
	ODD	-.31629*	.02605	.000	-.3743	-.2582
	ODE	.00027	.02605	.992	-.0578	.0583
ODC	OGA	-.02227	.02605	.413	-.0803	.0358
	OGB	-.04437	.02605	.119	-.1024	.0137
	ODD	-.36065*	.02605	.000	-.4187	-.3026
	ODE	-.04410	.02605	.121	-.1021	.0139
ODD	OGA	.33838*	.02605	.000	.2803	.3964
	OGB	.31629*	.02605	.000	.2582	.3743
	ODC	.36065*	.02605	.000	.3026	.4187
	ODE	.31655*	.02605	.000	.2585	.3746
ODE	OGA	.02183	.02605	.422	-.0362	.0799
	OGB	-.00027	.02605	.992	-.0583	.0578
	ODC	.04410	.02605	.121	-.0139	.1021
	ODD	-.31655*	.02605	.000	-.3746	-.2585

*. The mean difference is significant at the 0.05 level.

Lampiran 5. Hasil pemeriksaan waktu hancur tablet

No	Produk Generik		Produk Merk Dagang		
	OGA	OGB	ODC	ODD	ODE
1	7,33	3,08	8,03	7,6	0,96
2	7,52	3,13	8,52	7,75	1,18
3	8,62	3,2	8,65	7,83	1,27
4	8,77	3,12	8,78	7,85	1,47
5	8,87	3,25	8,23	8,15	1,57
6	8,37	3,07	8,32	8,17	1,8
\bar{x}	8,246667	3,141667	8,421667	7,891667	1,375
SD	0,66111	0,070261	0,279529	0,22578	0,29965

One-Sample Kolmogorov-Smirnov Test

		OGA	OGB	ODC	ODD	ODE
N		6	6	6	6	6
Normal Parameters ^{a,b}	Mean	8.2467	3.1417	8.4217	7.8917	1.3750
	Std. Deviation	.66111	.07026	.27953	.22578	.29965
Most Extreme Differences	Absolute	.241	.233	.142	.240	.137
	Positive	.197	.233	.142	.240	.137
	Negative	-.241	-.154	-.137	-.207	-.124
Kolmogorov-Smirnov Z		.589	.570	.348	.588	.336
Asymp. Sig. (2-tailed)		.878	.902	1.000	.880	1.000

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Waktu Hancur

Levene Statistic	df1	df2	Sig.
7.743	4	25	.000

Kruskal-wallis tests

Test Statistics^{a,b}

	Waktu Hancur
Chi-Square	23.966
Df	4
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: formula

Mann-Whitney Test OGA-OGB

Test Statistics^b

	Waktu Hancur
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGA-ODC

Test Statistics^b

	Waktu Hancur
Mann-Whitney U	18.000
Wilcoxon W	39.000
Z	.000
Asymp. Sig. (2-tailed)	1.000
Exact Sig. [2*(1-tailed Sig.)]	1.000 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGA-ODD

Test Statistics^b

	Waktu Hancur
Mann-Whitney U	12.000
Wilcoxon W	33.000
Z	-.961
Asymp. Sig. (2-tailed)	.337
Exact Sig. [2*(1-tailed Sig.)]	.394 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGA-ODE

Test Statistics^b

	Waktu Hancur
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGB-ODC

Test Statistics^b

	Waktu Hancur
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGB-ODD

Test Statistics^b

	Waktu Hancur
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

OGB-ODE

Test Statistics^b

	Waktu Hancur
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

ODC-ODD

Test Statistics^b

	Waktu Hancur
Mann-Whitney U	2.000
Wilcoxon W	23.000
Z	-2.562
Asymp. Sig. (2-tailed)	.010
Exact Sig. [2*(1-tailed Sig.)]	.009 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

ODC-ODE

Test Statistics^b

	Waktu Hancur
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 ^a

a. Not corrected for ties.

b. Grouping Variable: formula

ODD-ODE

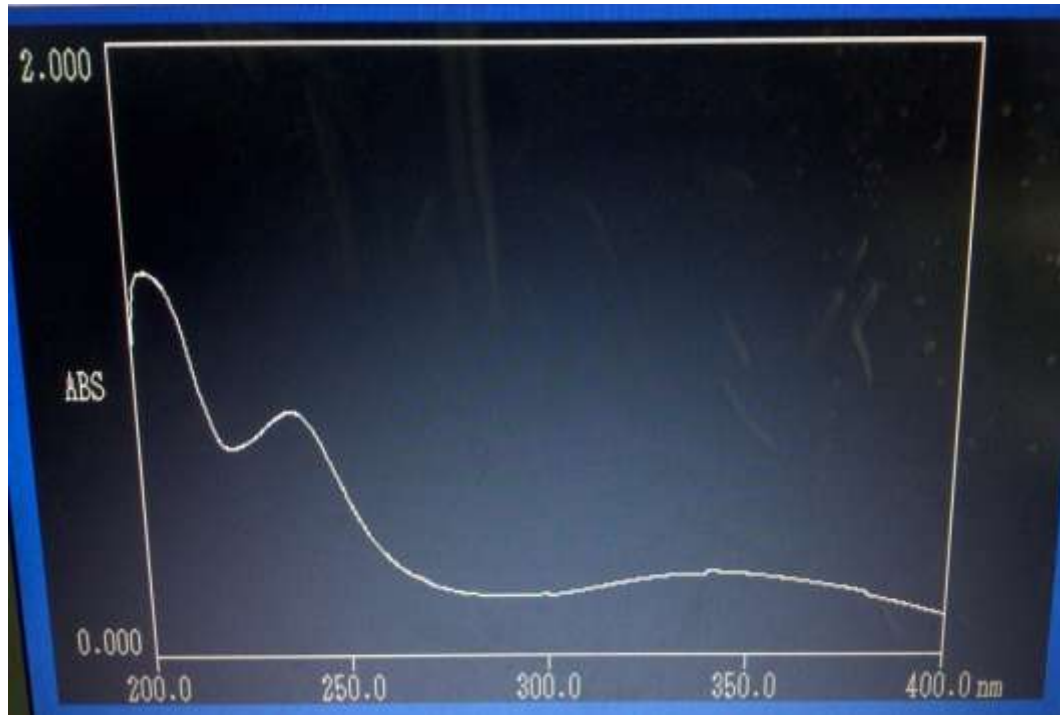
Test Statistics^b

	Waktu Hancur
Mann-Whitney U	.000
Wilcoxon W	21.000
Z	-2.882
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.002 ^a

a. Not corrected for ties.

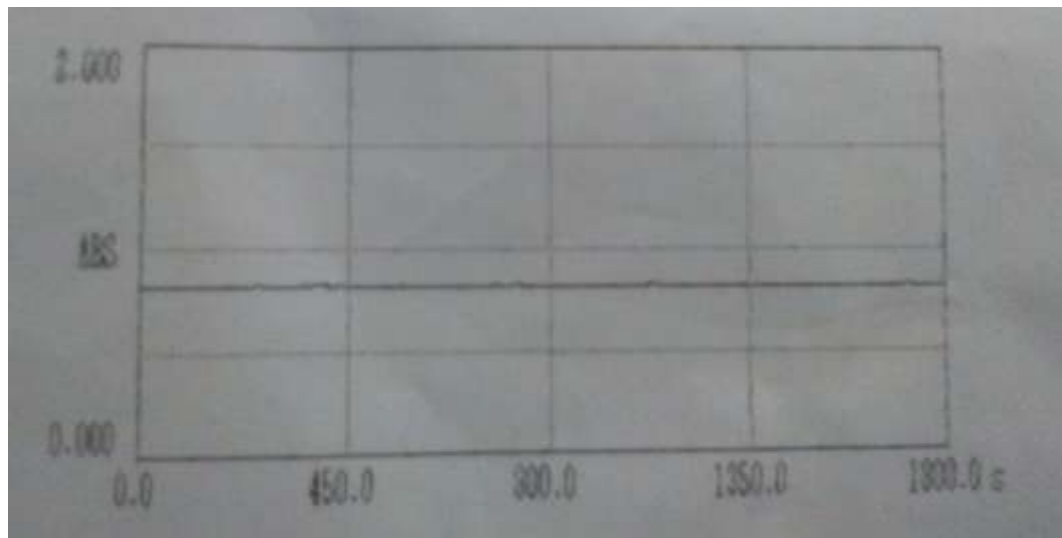
b. Grouping Variable: formula

Lampiran 6. Penentuan panjang gelombang serapan maksimum nifedipin



ID	WL(nm)	ABS	ID	WL(nm)	ABS	ID	WL(nm)	ABS
61	280.0	0.221	62	278.0	0.226	63	276.0	0.232
64	274.0	0.240	65	272.0	0.248	66	270.0	0.260
67	268.0	0.277	68	266.0	0.288	69	264.0	0.305
70	262.0	0.327	71	260.0	0.353	72	258.0	0.383
73	256.0	0.420	74	254.0	0.465	75	252.0	0.515
76	250.0	0.572	77	248.0	0.633	78	246.0	0.696
79	244.0	0.753	80	242.0	0.802	81	240.0	0.835
82	238.0	0.850	83	236.0	0.847	84	234.0	0.832
85	232.0	0.809	86	230.0	0.783	87	228.0	0.760
88	226.0	0.742	89	224.0	0.732	90	222.0	0.731

Lampiran 7. Penentuan *operating time* nifedipin



Data List (List Interval(s)=60.0)

ID	TIME(s)	ABS	ID	TIME(s)	ABS	ID	TIME(s)	ABS
1	0.0	0.833	2	60.0	0.831	3	120.0	0.833
4	180.0	0.829	5	240.0	0.833	6	300.0	0.833
7	360.0	0.831	8	420.0	0.832	9	480.0	0.833
10	540.0	0.833	11	600.0	0.833	12	660.0	0.833
13	720.0	0.833	14	780.0	0.834	15	840.0	0.833
16	900.0	0.832	17	960.0	0.832	18	1020.0	0.833
19	1080.0	0.833	20	1140.0	0.834	21	1200.0	0.833
22	1260.0	0.832	23	1320.0	0.833	24	1380.0	0.832
25	1440.0	0.832	26	1500.0	0.833	27	1560.0	0.833
28	1620.0	0.833	29	1680.0	0.832	30	1740.0	0.832
31	1800.0	0.832						

Lampiran 8. Penentuan kurva baku nifedipin

a. Cara pembuatan seri konsentrasi kurva baku nifedipin

Nifedipin $A_{1cm}^{1\%} = 595 M$

Range 0,2 – 0,8

Untuk range 0,2

$$\begin{aligned} A &= a \times b \times c \\ 0,2 &= 595 \times 1 \times c \\ C &= 3 \text{ ppm} = 0,3 \text{ mL} \end{aligned}$$

Untuk range 0,8

$$\begin{aligned} A &= a \times b \times c \\ 0,8 &= 595 \times 1 \times c \\ C &= 13 \text{ ppm} = 1,3 \text{ mL} \end{aligned}$$

Pembuatan larutan baku 500 ppm sebanyak 50 mL

Penimbangan nifedipin = $500 \text{ mg} / 1000 \text{ mL} \times 50 \text{ mL} = 25 \text{ mg}$

Perhitungan pembuatan seri larutan nifedipin

a. Konsentrasi 3 mg/L sebanyak 50 mL

$$\begin{aligned} V_1 C_1 &= V_2 C_2 \\ V_1 \cdot 500 \text{ ppm} &= 50 \text{ mL} \times 3 \text{ ppm} \\ V_1 &= 0,3 \text{ mL} \end{aligned}$$

b. Konsentrasi 5 mg/L sebanyak 50 mL

$$\begin{aligned} V_1 C_1 &= V_2 C_2 \\ V_1 \cdot 500 \text{ ppm} &= 50 \text{ mL} \times 5 \text{ ppm} \\ V_1 &= 0,5 \text{ mL} \end{aligned}$$

c. Konsentrasi 7 mg/L sebanyak 50 mL

$$\begin{aligned} V_1 C_1 &= V_2 C_2 \\ V_1 \cdot 500 \text{ ppm} &= 50 \text{ mL} \times 7 \text{ ppm} \\ V_1 &= 0,7 \text{ mL} \end{aligned}$$

d. Konsentrasi 9 mg/L sebanyak 50 mL

$$\begin{aligned} V_1 C_1 &= V_2 C_2 \\ V_1 \cdot 500 \text{ ppm} &= 50 \text{ mL} \times 9 \text{ ppm} \\ V_1 &= 0,9 \text{ mL} \end{aligned}$$

e. Konsentrasi 11 mg/L sebanyak 50 mL

$$\begin{aligned} V_1 C_1 &= V_2 C_2 \\ V_1 \cdot 500 \text{ ppm} &= 50 \text{ mL} \times 11 \text{ ppm} \\ V_1 &= 1,1 \text{ mL} \end{aligned}$$

f. Konsentrasi 13 mg/L sebanyak 50 mL

$$\begin{aligned} V_1 C_1 &= V_2 C_2 \\ V_1 \cdot 500 \text{ ppm} &= 50 \text{ mL} \times 13 \text{ ppm} \\ V_1 &= 1,3 \text{ mL} \end{aligned}$$

b. Kurva baku nifedipin

Konsentrasi (ppm)	Absorbansi
3	0,186
5	0,298
7	0,414
9	0,528
11	0,632
13	0,772

Regresi linier

$$a = 0,0093$$

$$b = 0,0578$$

$$r = 0,999$$

persamaan regresi linier $Y = 0,0578 X + 0,0093$

Lampiran 9. Hasil pemeriksaan keseragaman kadar nifedipin

No	Kadar Nifedipin Dalam Tablet (mg)				
	OGA	OGB	ODC	ODD	ODE
1	10,9516	10,20185	10,27874	10,77855	10,72088
2	9,99038	10,97078	10,4902	10,25952	10,33641
3	10,9708	10,4902	10,4133	10,1826	10,35563
4	10,1442	10,75932	10,00961	10,567089	10,18262
5	10,99	10,29796	10,99	10,33641	10,35563
6	10,471	10,27874	10,14418	10,64398	10,39408
7	10,4902	10,66321	10,52864	10,54787	10,56709
8	10,4517	10,62476	10,52864	10,97078	10,37486
9	10,125	10,99	10,83622	10,951557	10,99
10	10,9708	10,43253	10,29796	10,99	10,37486
\bar{x}	10,5556	10,570935	10,451749	10,6228356	10,465206
SD	0,39252	0,2797188	0,29739276	0,29910971	0,2340463
CV(%)	3,71862	2,6461119	2,84538754	2,81572382	2,23642328

Contoh perhitungan keseragaman kadar tablet nifedipin

Persamaan kurva baku $Y = 0,0578 X + 0,0093$

Obat OGA (Obat Generik A)

NO	BOBOT		Absorbansi	Kadar mg/L	Kadar mg/mL	Kadar/Tablet mg	% Kadar dalam tablet
	TABLET (mg)	SAMPEL (mg)					
1	308	154	0,579	9,856	0,010	10,952	109,516
2	299	149,5	0,529	8,991	0,008	9,990	99,904
3	305	152,5	0,58	9,874	0,010	10,971	109,708
4	298	149	0,537	9,130	0,009	10,144	101,442
5	308	154	0,581	9,891	0,010	10,990	109,900
6	299	149,5	0,554	9,424	0,009	10,471	104,710
7	301	150,5	0,555	9,441	0,009	10,490	104,902
8	306	153	0,553	9,407	0,009	10,452	104,517
9	301	150,5	0,536	9,112	0,009	10,125	101,250
10	310	155	0,58	9,874	0,010	10,971	109,708

$$Y = 0,0578 X + 0,0093$$

$$\begin{aligned} \text{Konsentrasi} &= \frac{(\text{Absorbansi} - a)}{b} \\ &= \frac{(0,579 - 0,0093)}{0,0578} \\ &= 9,856401384 \text{ mg/L} \\ &= 0,00986 \text{ mg/mL} \end{aligned}$$

Kadar per tablet = kadar x faktor pembuatan x faktor pengenceran x 2

$$\begin{aligned} &= 0,009856 \text{ mg/mL} \times 50 \text{ mL} \times \frac{10}{0,9} \times 2 \\ &= 10,95 \text{ mg} \end{aligned}$$

Lampiran 10. Hasil pemeriksaan % kadar terdisolusi nifedipin

a. Produk generik A (OGA)

Waktu (menit)	Kadar Obat Terdisolusi						$\bar{x} \pm SD$
	Replikasi						
	1	2	3	4	5	6	
5	54,14014	63,01557	57,09862	62,85986	64,72837	62,70415	60,76 ± 4,13
15	76,85242	87,07215	86,85069	76,63789	86,93547	86,91298	83,54 ± 5,27
30	87,97647	91,92457	92,63564	87,91419	91,63045	92,54221	90,77 ± 2,22
45	94,0763	94,4846	95,20433	94,01228	94,34273	95,73201	94,64 ± 0,68
60	96,02907	96,4391	96,85606	95,6519	96,2955	97,70035	96,50 ± 0,75

b. Produk generik B (OGB)

Waktu (menit)	Kadar Obat Terdisolusi						$\bar{x} \pm SD$
	Replikasi						
	1	2	3	4	5	6	
5	56,00865	56,16436	55,85294	56,16436	56,47578	54,76298	55,90 ± 0,60
15	76,71747	73,91644	80,60848	76,7192	73,9199	80,59637	77,08 ± 3,00
30	83,94706	81,27059	83,98858	83,94879	81,27405	83,97647	83,07 ± 1,39
45	85,64204	87,45173	86,61782	88,29083	85,27526	88,31851	86,93 ± 1,31
60	90,77128	90,26609	92,06886	91,26955	88,37682	92,54291	90,88 ± 1,48

c. Produk bermerk dagang C (ODC)

Waktu (menit)	Kadar Obat Terdisolusi						$\bar{x} \pm SD$
	Replikasi						
	1	2	3	4	5	6	
5	51,33737	50,0917	50,71453	51,02595	51,33737	51,64879	51,03 ± 0,56
15	74,95277	73,69325	73,23304	74,7936	74,01851	74,17768	74,15 ± 0,65
30	81,38478	77,46436	84,16159	81,691	77,32595	83,87093	80,98 ± 3,00
45	87,72336	87,80813	91,30986	87,72163	87,97941	91,17145	88,95 ± 1,78
60	86,65363	85,9564	94,80415	86,03253	86,12941	94,50657	89,01 ± 4,38

d. Produk bermerk dagang D (ODD)

Waktu (menit)	Kadar Obat Terdisolusi						$\bar{x} \pm SD$
	Replikasi						
	1	2	3	4	5	6	
5	50,0917	43,86332	58,34429	49,93599	47,44464	50,2474	49,99 ± 4,77
15	82,72439	82,96661	81,41471	82,41125	80,20363	82,88183	82,10 ± 1,09
30	92,04567	87,93149	87,45052	90,01626	85,91592	92,20484	89,26 ± 2,58
45	93,67491	92,94135	92,76488	92,40156	90,74758	93,99152	92,75 ± 1,15
60	94,84394	94,7263	95,1692	94,80242	93,90969	95,16401	94,77 ± 0,46

e. Produk bermerk dagang E (ODE)

Waktu (menit)	Kadar Obat Terdisolusi						$\bar{x} \pm SD$
	Replikasi						
	1	2	3	4	5	6	
5	89,33045	87,46194	89,48616	90,109	88,5519	89,33045	89,05 ± 0,92
15	91,10156	89,67941	91,57042	92,51159	90,62578	91,25727	91,12 ± 0,95
30	93,81557	92,06644	92,88824	96,01972	92,86747	92,72734	93,40 ± 1,41
45	94,99152	94,46903	97,01228	96,75277	96,99152	96,69394	96,16 ± 1,12
60	98,66055	97,82145	98,52388	99,9737	100,0602	98,35779	98,90 ± 0,912

Contoh perhitungan kadar terdissolusi nifedipin

Obat generik A (OGA) replikasi 1

Waktu	absorbansi	Kadar	Terdissolusi	Koreksi	Total Koreksi	Total Terdissolusi	% Terdissolusi
0	0	0	0		0	0	0
5	0,357	6,016	5,414	0	0	5,414	54,14
15	0,499	8,472	7,625	0,06	0,06	7,685	76,852
30	0,565	9,614	8,653	0,085	0,145	8,798	87,976
45	0,598	10,185	9,167	0,096	0,241	9,408	94,076
60	0,604	10,289	9,26	0,102	0,343	9,603	96,029

Persamaan kurva baku $Y = b X + a$

$$Y = 0,0578 X + 0,0093$$

$$\begin{aligned} \text{Kadar} &= \frac{\text{Absorbansi} - a}{b} \\ &= \frac{0,357 - 0,0093}{0,0578} \\ &= 6,016 \text{ mg/L} \end{aligned}$$

$$\begin{aligned} \% \text{ terdissolusi} &= \frac{(\text{kadar} \times \text{media}) + \text{total koreksi}}{\text{dosis}} \times 100 \% \\ &= \frac{(6,016 \times 0,9) + 0}{10 \text{ mg}} \times 100 \% \\ &= \frac{5,41}{10 \text{ mg}} \times 100 \% \\ &= 54,10 \% \end{aligned}$$

Lampiran 11. Hasil perhitungan Q_{45}

Replikasi	Q45(%)				
	OGA	OGB	ODC	ODD	ODE
1	94,0763	85,64204	87,72336	93,67491	94,99152
2	94,4846	87,45173	87,80813	92,94135	94,46903
3	95,20433	86,61782	91,30986	92,76488	97,01228
4	94,01228	88,29083	87,72163	92,40156	96,75277
5	94,34273	85,27526	87,97941	90,74758	96,99152
6	95,73201	88,31851	91,17145	93,99152	96,84965
\bar{x}	94,642	86,9327	88,9523	92,7536	96,1778
SD	0,68341	1,3074	1,77557	1,14584	1,13733

NPar Tests

One-Sample Kolmogorov-Smirnov Test

		OGA	OGB	ODC	ODD	ODE
N		6	6	6	6	6
Normal Parameters ^{a,b}	Mean	94.6420	86.9327	88.9523	92.7536	96.1778
	Std. Deviation	.68341	1.30740	1.77557	1.14583	1.13733
Most Extreme Differences	Absolute	.258	.184	.375	.213	.360
	Positive	.258	.172	.375	.140	.232
	Negative	-.178	-.184	-.244	-.213	-.360
Kolmogorov-Smirnov Z		.631	.450	.918	.521	.882
Asymp. Sig. (2-tailed)		.820	.987	.368	.949	.418

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

Q45

Levene Statistic	df1	df2	Sig.
2.656	4	25	.056

ANOVA

Q45

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	359.458	4	89.864	56.622	.000
Within Groups	39.677	25	1.587		
Total	399.135	29			

Post Hoc Tests

Multiple Comparisons

Q45

LSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
OGA	OGB	7.70934*	.72734	.000	6.2114	9.2073
	ODC	5.68973*	.72734	.000	4.1917	7.1877
	ODD	1.88841*	.72734	.016	.3904	3.3864
	ODE	-1.53575*	.72734	.045	-3.0337	-.0378
OGB	OGA	-7.70934*	.72734	.000	-9.2073	-6.2114
	ODC	-2.01961*	.72734	.010	-3.5176	-.5216
	ODD	-5.82094*	.72734	.000	-7.3189	-4.3229
	ODE	-9.24510*	.72734	.000	-10.7431	-7.7471
ODC	OGA	-5.68973*	.72734	.000	-7.1877	-4.1917
	OGB	2.01961*	.72734	.010	.5216	3.5176
	ODD	-3.80133*	.72734	.000	-5.2993	-2.3033
	ODE	-7.22549*	.72734	.000	-8.7235	-5.7275
ODD	OGA	-1.88841*	.72734	.016	-3.3864	-.3904
	OGB	5.82094*	.72734	.000	4.3229	7.3189
	ODC	3.80133*	.72734	.000	2.3033	5.2993
	ODE	-3.42416*	.72734	.000	-4.9222	-1.9262
ODE	OGA	1.53575*	.72734	.045	.0378	3.0337
	OGB	9.24510*	.72734	.000	7.7471	10.7431
	ODC	7.22549*	.72734	.000	5.7275	8.7235
	ODD	3.42416*	.72734	.000	1.9262	4.9222

*. The mean difference is significant at the 0.05 level.

Lampiran 12. Hasil perhitungan DE₆₀

Replikasi	DE60(%)				
	OGA	OGB	ODC	ODD	ODE
1	80,2953	76,7276	75,2579	81,7814	89,6801
2	84,6742	75,8836	73,6769	79,8266	88,4775
3	84,2982	77,9353	77,626	81,2044	90,0536
4	81,2618	77,4723	75,2621	80,8658	91,4616
5	84,7328	75,1439	73,9302	78,5443	89,9261
6	85,226	78,2779	77,7562	81,9926	89,8283
\bar{x}	83,4147	76,9068	75,5849	80,7025	89,9045
SD	2,08571	1,2202	1,75899	1,30629	0,95286

NPar Tests

One-Sample Kolmogorov-Smirnov Test

		OGA	OGB	ODC	ODD	ODE
N		6	6	6	6	6
Normal Parameters ^{a,b}	Mean	83.4147	76.1976	75.5848	80.7025	89.9045
	Std. Deviation	2.08570	1.47413	1.75885	1.30629	.95286
Most Extreme Differences	Absolute	.331	.167	.239	.216	.271
	Positive	.193	.145	.239	.162	.271
	Negative	-.331	-.167	-.210	-.216	-.240
Kolmogorov-Smirnov Z		.810	.409	.587	.530	.664
Asymp. Sig. (2-tailed)		.528	.996	.882	.941	.770

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

DE60

Levene Statistic	df1	df2	Sig.
2.020	4	25	.122

ANOVA

DE60

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	824.809	4	206.202	84.294	.000
Within Groups	61.156	25	2.446		
Total	885.964	29			

Multiple Comparisons

DE60

LSD

(I) formula	(J) formula	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
OGA	OGB	7.21710*	.90300	.000	5.3573	9.0769
	ODC	7.82993*	.90300	.000	5.9702	9.6897
	ODD	2.71220*	.90300	.006	.8524	4.5720
	ODE	-6.48982*	.90300	.000	-8.3496	-4.6301
OGB	OGA	-7.21710*	.90300	.000	-9.0769	-5.3573
	ODC	.61283	.90300	.504	-1.2469	2.4726
	ODD	-4.50490*	.90300	.000	-6.3647	-2.6451
	ODE	-13.70692*	.90300	.000	-15.5667	-11.8472
ODC	OGA	-7.82993*	.90300	.000	-9.6897	-5.9702
	OGB	-.61283	.90300	.504	-2.4726	1.2469
	ODD	-5.11773*	.90300	.000	-6.9775	-3.2580
	ODE	-14.31975*	.90300	.000	-16.1795	-12.4600
ODD	OGA	-2.71220*	.90300	.006	-4.5720	-.8524
	OGB	4.50490*	.90300	.000	2.6451	6.3647
	ODC	5.11773*	.90300	.000	3.2580	6.9775
	ODE	-9.20202*	.90300	.000	-11.0618	-7.3423
ODE	OGA	6.48982*	.90300	.000	4.6301	8.3496
	OGB	13.70692*	.90300	.000	11.8472	15.5667
	ODC	14.31975*	.90300	.000	12.4600	16.1795
	ODD	9.20202*	.90300	.000	7.3423	11.0618

*. The mean difference is significant at the 0.05 level.

Lampiran 13. Hasil perhitungan nilai f_2 dan f_1

No	Produk Obat	similarity factor	
		f_1	f_2
1	OGA-OGB	7,58829	58,88377
2	OGA-ODC	9,73524	53,39459
3	OGA-ODD	4,54626	69,79643
4	OGA-ODE	6,18181	62,25475
5	OGB-ODC	2,32325	74,55324
6	OGB-ODD	3,291819	75,78291
7	OGB-ODE	1,521967	75,22867
8	ODC-ODD	5,748623	65,45649
9	ODC-ODE	3,936675	70,12809
10	ODD-ODE	1,71345	81,60331

Keterangan :

1. Obat generik A (OGA)
2. Obat generik B (OGB)
3. Obat merk dagang C (ODC)
4. Obat merk dagang D (ODD)
5. Obat merk dagang E (ODE)

Contoh perhitungan nilai F_2

Produk pembanding obat generik A (OGA)

Produk uji obat generik B (OGB)

Waktu (menit)	R	T	R-T	(R-T) ²
5	60,75779	55,90484	4,85295	23,55112
15	83,5436	77,07964	6,46396	41,78278
30	90,77059	83,06759	7,703	59,33621
45	94,64204	86,9327	7,70934	59,43392
60	96,49533	90,88258	5,61275	31,50296
			$\Sigma(R-T)^2$	215,607

$$\begin{aligned}
f_2 &= 50 \log \left[\frac{100}{\sqrt{1 + \frac{\sum_{t=1}^n (R_t - T_t)^2}{n}}} \right] \\
&= 50 \log \left[\frac{100}{\sqrt{1 + \frac{215,607}{5}}} \right] \\
&= 50 \log \left[\frac{100}{\sqrt{1+43,1214}} \right] \\
&= 50 \log \left[\frac{100}{\sqrt{44,1214}} \right] \\
&= 50 \log \left[\frac{100}{6,64239} \right] \\
&= 50 \log [15,0548] \\
&= 58,883
\end{aligned}$$

Waktu (menit)	R	T	R-T	(R-T) ²
5	60,75779	55,90484	4,85295	23,55112
15	83,5436	77,07964	6,46396	41,78278
30	90,77059	83,06759	7,703	59,33621
45	94,64204	86,9327	7,70934	59,43392
60	96,49533	90,88258	5,61275	31,50296
	$\Sigma=426,209$		$\Sigma=32,342$	

$$\begin{aligned}
f_1 &= \left\{ \left[\sum_{t=1}^n |R_t - T_t| \right] / \left[\sum_{t=1}^n R_t \right] \right\} \times 100 \\
&= \frac{32,342}{426,209} \times 100 \\
&= 7,5883
\end{aligned}$$

Lampiran 14. Foto alat



Dissolution tester tipe paddle



Spektrofotometer UV-Vis



Disintegration tester



Friability tester



Hardness tester



Neraca analitik